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## NOVA SAZNANJA NAKON RADIOLOŠKIH ISTRAŽIVANJA MUMIJA EGIPATSKE ZBIRKE AMZ-a

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**Izvorni znanstveni rad**

*Objava rezultata najnovijih radioloških istraživanja na ljudskim i životinjskim mumijama Egipatske zbirke Arheološkog muzeja u Zagrebu, obavljanim 2009. i 2011. godine u KB Dubrava.*

*Ključne riječi: mumija, mumificiranje, dijelovi tijela, skeniranje, kompjutorska tomografija, magnetska rezonancija*

*Key words: mummies, mummification, body parts, scan, computer tomography, magnetic resonance imaging*

U Arheološkom muzeju u Zagrebu čuva se ukupno 18 mumificiranih ostataka iz razdoblja faraonskog Egipta. Među tim predmetima je: pet cjelovitih ljudskih mumija, osam dijelova ljudskog tijela te pet životinjskih cjelina<sup>1</sup>. Četiri od pet mumija izložene su u stalnom postavu Egipatske zbirke Muzeja. Ti su: tzv. »Zagrebačka mumija«, mumija Šepenun, mumija Kaipamau i mumija za koju se prije početka istraživanja smatralo da pripada gospodarici kuće Kareset u čijem se sarkofagu nalazila. Takozvana »peta mumija« također je mumija žene kojoj nije pronađeno ime.

Istraživanja zagrebačkih mumija započela su 2009. godine, i to upravo od »pete mumije«. Ona je, naime, desetljećima bila pohranjena u deponiju Muzeja, pri čemu nije bilo jasno radi li se uistinu o egipatskoj mumiji. Naime, tu je mumiju u 19. stoljeću Muzeju donirao

<sup>1</sup> Naime, svi umotani predmeti ne potječu od jedne životinje, već su među nekima prepoznate hrpice kostiju više životinja.

biskup Juraj Haulik, ali ona se nalazi u evidentno neautentičnom drvenom sarkofagu. Ništa o podrijetlu ovog spomenika nije bilo poznato. Moguće je samo pretpostaviti da je lijes s mumijom dospio na tržište starina u vrijeme kad se iz Egipta iznosilo arheološko blago bez ikakve kontrole. No u isto doba, a riječ je o 19. i početku 20. stoljeća, na europskim tržištima antikviteta pojavilo se i mnoštvo krivotvorina. Tako je i ovaj sarkofag vjerojatno produkt iz ere egiptomanije<sup>2</sup> – razdoblja masovnog imitiranja egipatske umjetnosti. U tom smislu postavljalo se pitanje tijela koje se nalazi u sarkofagu. Mumija je omotana jednim slojem kartonaže<sup>3</sup> koja je u području lica i abdomena uništena. Vidi se lice s umjetnim, staklenim očima, i otvorenim ustima, a na abdomenu u području spolnih organa rupa. Prve analize obavili su kolege iz Instituta za antropologiju dr. Ivor Janković i dr. Petra Rajić-Šikanjić. Oni su zaključili da se radi o ženskoj osobi. Uskoro je uz pomoć C14 obavljeno i datiranje tijela te ustanovljeno da je riječ o tijelu osobe iz 4. stoljeća pr. Kr. Taj podatak dao je, dakako, naslutiti da bi mumija ipak trebala biti iz Egipta. No prava potvrda stigla je tek nakon radiološke obrade. Antropolozi su stupili u kontakt s radiologom dr. Mislavom Čavkom koji je pokazao interes za skeniranje mumije (Sl. 1). Kompjutorska tomografija mumije pokazala je da su iz tijela uklonjeni organi, te mozak, a u kranijalnoj šupljini vidljivi su ostaci ulja kojom je lubanja isprana iznutra nakon izvlačenja mozga. Također, u prostoru lubanje bio je vidljiv manji predmet (dužine oko 5 cm). Uz pomoć sonda taj je predmet u Kliničkoj Bolnici Dubrava izvučen, te je ustanovljeno da se radi o komadu drveta, (Sl. 2), letvici pomoću koje je mozak bio raskomadan kako bi se lakše izvukao. Ova tehnika poznata je u egiptologiji, a koristila se u situacijama kad na raspolaganju nije bio finih instrumenata. Inače se u tu svrhu koristilo dugačke metalne instrumente s kukom na vrhu.

Analiza »pete mumije« donijela je još nekoliko iznenađenja. Evidentno, na mumiji su izvršene neke preinake u novije doba. Mumija je probodena čitavom dužinom tijela metalnom motkom te pojačana remenjem po širini. Možda je pokazivala znake pucanja pa je netko želio to spriječiti. Pravi razlog ovih intervencija, međutim, nije jasan. Sigurno je samo da one nisu izvedene u faraonsko doba.

Rezultati CT-a »pete mumije« pokrenule su interes grupe znanstvenika da se istraže i ostale mumije Arheološkog muzeja u Zagrebu. RTG ljudskih mumija iz Egipatske zbirke Muzeja obavljen je u 80-im godinama prošlog stoljeća (PLAVŠIĆ 1986: 99-103; 1993-1994: 157-166). Tada ja u središtu interesa bila »Zagrebačka mumija« poznata po etruščanskom tekstu na povojima. Nove metode i posebice nova oprema postavile su nove izazove pa se skeniranja mumija posljednjih godina obavljaju u nizu zemalja. U isto vrijeme je u Kairu CT-om skenirana i mumija Tutankhamona.

Zagrebačka istraživanja nakon »pete mumije« okrenula su se ostalim cjelovitim mumijama iz zbirke. Radiološka obrada mumije žene (kako se tada mislilo) Kareset na čijem drvenom sarkofagu se spominje »gospodarica kuće« toga imena donijelo je niz iznenađenja. Prvo je ustanovljeno da je mumija izrađena vrlo kvalitetno te da su unutarnji organi nakon zasebne mumifikacije vraćeni u tijelo (Sl. 3). CT i MR snimke pokazale su dvije vreće s organima umotanim u lanene trake, otprilike u sredini visine trupa sa svake strane po jednu. Ovakav postupak povezuje se s dobom 21. dinastije (1069.-945. pr. Kr.) te periodom neposredno nakon

<sup>2</sup> »Egiptomanija« je pokret u estetici vezan uz oduševljenje potaknuto istraživanjima faraonskog Egipta koji se u Europi proširio u 19. stoljeću. Pokret se oslanja na romantično i mistično promišljanje faraonskog doba i oduševljenje njegovom estetikom. Izrađuje se namještaj u egipatskom stilu, ljudi se ukapaju u ljesovima nalik egipatskim, a na grobljima europskih gradova pojavljuju se piramide. Jedna od njih može se vidjeti i na zagrebačkom Mirogoju.

<sup>3</sup> Smjesa od blata i povapnjenjena platna ili papirusa koju su Egipćani koristili kao jedan od slojeva u zaštiti mumije.

nje. Postalo je jasno da je potrebno obaviti C 14. Rezultat toga testa potvrdio je da mumija ne pripada u sarkofag u kojem je pristigla kao dio Kollerove<sup>4</sup> zbirke. Naime, mumija je datirana u 8. stoljeće pr. Kr., što znači da je čak oko 500 godina starija od lijesa. A da hijeroglifski zapis »Kareset gospodarica kuće« doista nije povezan s ovim tijelom potvrdila je i spoznaja da se radi o mumiji muške osobe. Na CT i MR snimkama jasno se vidi osušeni ostatak muškog organa. Antropološki uvid također je potvrdio da kostur osobe odgovara građi muškarca. Riječ je, dakle, o još jednoj u nizu »podmetnutih« (ili eng. *misplaced*) mumija u muzejskim zbirkama, koja je postala »mumija nepoznatog muškarca«. Slijedom toga treba se nadati da će Muzej uskoro pronaći način da bude izložena neovisno o sarkofagu u kojem se nalazi.

Obrada ostalih ljudskih mumija nije donijela tako drastične novine. Mumija Amonove pjevačice Kaipamau<sup>5</sup> iz 22. dinastije (945.-715. pr. Kr.), koja je pristigla u Zagreb 1970. kao poklon egipatske vlade, izrađena je prilično loše, i sreća je da se nalazi u prilično kompaktnoj kartonaži kojom je dobro zaštićena. Čini se da su pri mumificiranju ove svećenice primijenjene najjeftinije metode koje su korištene u Egiptu. Tek u nešto boljem stanju je mumija žene Šepenun (3. st. pr. Kr.) (SALEH 1970: 897, 174-180.). Mozak je, kako je to bilo uobičajeno, izvađen kroz nos, no ostatci moždane ovojnice u lubanji su obilni i dobro sačuvani, u tijelu se vide ostatci osušenih organa, a šupljine su ispunjene mješavinom smole i suhe tvari (vjerojatno ostataka ulja ili palmina vina za ispiranje) te platna i vjerojatno blata.

Kad je riječ o globalno poznatoj »Zagrebačkoj mumiji« skeniranja su pokazala da nema koštanog defekta lubanje koji je spomenut u prijašnjim RTG istraživanjima. Torakalna i abdominalna šupljina novom su tehnologijom viđena mnogo bolje. Toraks je prazan (uopće mumija je ispražnjena od organa), dok su abdomen i zdjelica ispunjeni platnom. Artrotske promjene nisu izražene. Aparati na čelu mumije (niti igdje u tijelu) nisu detektirali metal, što znači da se na njemu nalazi neka voštana masa.

Rezultati najnovijih zagrebačkih istraživanja koja su završena na jesen 2011. godine objavljeni su u nizu medicinskih stručnih časopisa, a skenovi su pridruženi kanadskoj internet-skoj bazi IMPACT koja objedinjuje sva radiološka istraživanja egipatskih mumija u svijetu.

<sup>4</sup> Vidi: MIRNIK – URANIĆ 1998: 197-211.

<sup>5</sup> Vidi: URANIĆ 2003.

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## NEW INFORMATION GAINED BY RADIOLOGICAL INVESTIGATION OF MUMMIES IN THE EGYPTIAN COLLECTION OF THE ARCHAEOLOGICAL MUSEUM IN ZAGREB

*Publication of results from the latest radiological investigation of human and animal mummies of the Egyptian Collection of the Archaeological Museum in Zagreb, carried out in 2009 and 2011 at the Dubrava Medical Centre.*

*Key words: mummies, mummification, body parts, scan, computer tomography, magnetic resonance imaging*

A total of 18 mummified remains from the pharaonic Egyptian period are kept in the Archaeological Museum in Zagreb. Among them, there are five complete human mummies, eight human body parts and five animal units.<sup>1</sup> Four of the five mummies are displayed in the permanent exhibition of the Museum's Egyptian Collection. These are the so-called "Zagreb mummy", Shepenun mummy, Kaipamau mummy and a mummy which was believed, prior to this investigation, to have belonged to the lady of the Kareset house, in whose sarcophagus it lay. The so-called 'fifth mummy' is also the mummy of a woman whose name has not been discovered.

The investigation of the Zagreb mummies began in 2009, starting with the 'fifth mummy'. It had been stored in the Museum depot for decades, and it had not been clear whether it was truly an Egyptian mummy. The mummy was donated to the Museum in the 19<sup>th</sup> c. by Bishop Juraj Haulik, but it lies in a wooden sarcophagus which clearly is not authentic. Nothing is known about the origin of this artefact. It can be assumed that the coffin and the mummy appeared on the antiques market at the time when archaeological heritage was being taken out of Egypt without any control. But at the same time, that is, in the 19<sup>th</sup> and the early 20<sup>th</sup> centuries, there were also many forgeries on the European antiques markets. This sarcophagus is probably one such product of Egyptomania<sup>2</sup> – an era of mass imitation of Egyptian art. With this in mind, the identity of the body lying inside the sarcophagus was questioned. The mummy was wrapped in one layer of cartonnage<sup>3</sup>, which had been destroyed in the area of the face and abdomen. Thus uncovered, the face, with artificial, glass eyes and an open mouth, was visible, while in the abdominal region, in the area of the sexual organs, there was a hole. The first analyses were carried out by Dr. Ivor Janković and Dr. Petra Rajić-Šikanjić of the Institute of Anthropology. They concluded that this was a female mummy. Soon afterwards, radiocarbon analysis was performed, and the mummy was dated to the 4<sup>th</sup> century BC. Obviously, this information suggested that the mummy had originated from Egypt after all. But the real confirmation only came after the radiological treatment. The anthropologists got in touch with radiologist Dr. Mislav Čavka, who expressed an interest in scanning the mummy (Fig. 1).

<sup>1</sup> The wrapped items do not belong all to one animal. Some of them contain heaps of bones of several animals.

<sup>2</sup> "Egyptomania" is an aesthetic movement linked to enthusiasm spurred by the exploration of pharaonic Egypt, which spread across Europe in the 19<sup>th</sup> c. The movement relied on romantic and mystic reflection of the pharaonic age and enthusiastic reception of its aesthetics. Egyptian-style furniture was made, the deceased were buried in coffins resembling sarcophagi, and pyramids were erected in cemeteries of European towns. One of them can be seen in the Mirogoj cemetery in Zagreb.

<sup>3</sup> A mixture of mud and limed linen or papyrus which was used by the Egyptians as one of the layers protecting mummies.

Computer tomography of the mummy revealed that internal organs and the brain had been removed from the body, and inside the cranial cavity there were visible remains of the oil which was used to wash out the inside of the skull after the brain had been extracted. Furthermore, inside the skull, there was a small object (about 5 cm long). The object was extracted using probes at the Dubrava Medical Centre, and it was identified as a piece of wood (Fig. 2), a small bar that had been used to break the brain into pieces to facilitate its extraction. This technique, known in Egyptology, was used in situations in which delicate instruments were not available. Usually long metal instruments with a hook at the top were used for this purpose.

The study of the "fifth mummy" brought several more surprises. It was evident that some modifications had been effected on the mummy in the later periods. A metal rod pierced the length of the mummy, and it was reinforced across its width by belts. Possibly there had been signs of cracking, and somebody wanted to prevent that from happening. Nonetheless, the real motive of these interventions is not clear. The only certain aspect is that they were not made in the pharaonic age.

The CT scans of the "fifth mummy" incited the interest of a group of scientists in investigating other mummies in the Archaeological Museum in Zagreb. The human mummies from the Museum's Egyptian Collection had been x-rayed in the 1980s (PLAVŠIĆ 1986: 99-103; 1993-1994: 157-166). At that time, the "Zagreb mummy" was the focus of interest, famous for the Etruscan inscription on the bandages. New methods, and especially new equipment, have set new challenges, and thus in recent years mummies have been scanned in a number of countries. At the same time, Tutankhamun's mummy was studied by CT scan in Cairo.

In Zagreb, after the 'fifth mummy', the investigation turned to the remaining complete mummies in the collection. The radiological analysis of the female mummy (as was believed at the time) Kareset, set in the wooden sarcophagus with an inscription mentioning the "lady of the house" of that name, resulted in several surprises. Firstly, it was established that the mummification was of a high quality, and that internal organs had been mummified separately and subsequently placed back in the body (Fig. 3). The CT scans and MRI images revealed two bags containing organs wrapped in linen bands, one on each side at approximately the half-height of the trunk. Such a procedure is associated with the period of the 21<sup>st</sup> dynasty (1069-945 BC) and the time immediately thereafter. It became clear that radiocarbon dating was in order. The result of the analysis has confirmed that the mummy did not belong in the sarcophagus in which it arrived at the Museum, as part of Koller's collection.<sup>4</sup> The mummy has been dated to the 8<sup>th</sup> century BC, which means that it is as much as 500 years or so older than the coffin. The fact that the hieroglyphic inscription "Kareset the lady of the house" has no link with this body has been additionally confirmed by the information that this is a male mummy. The remains of the male organ are clearly visible on CT scans and MR images. An anthropological analysis has also confirmed that the skeleton corresponds to a male build. So this is yet another in a range of misplaced mummies in museum collections, which has become the 'mummy of an unknown man'. One should hope that the Museum will soon find a way to display it, regardless of the sarcophagus it lies in.

The scanning of other human mummies has not revealed such dramatic news. The mummy of Amon's singer Kaipamau<sup>5</sup> of the 22<sup>nd</sup> dynasty (945-715 BC), which arrived in Zagreb in 1970, as a gift of the Egyptian government, is of a rather low quality, and it is fortunate that it is

<sup>4</sup> See: MIRNIK – URANIĆ 1998: 197-211.

<sup>5</sup> See: URANIĆ 2003

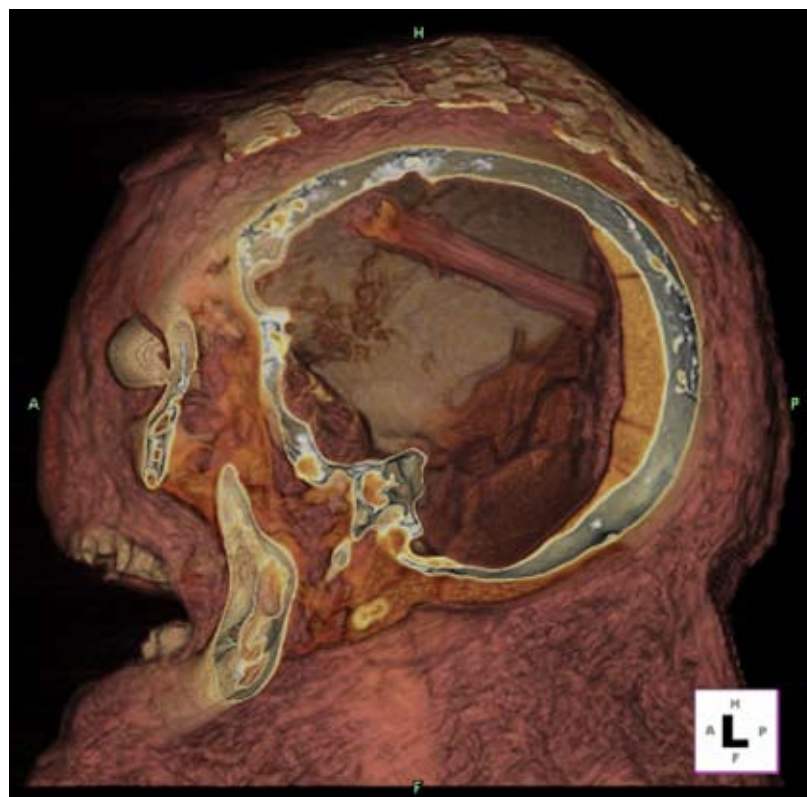
well protected by the somewhat compact cartonnage. It would appear that the mummification of this priestess was done using the cheapest methods available in Egypt. The condition of the mummy of the woman Shepenun (3<sup>rd</sup> c. BC) (SALEH 1970: 897, 174-180) is only slightly better. Its brain was extracted through the nose, as was customary, but the remains of the meninx are plentiful and well preserved, remains of dried internal organs are visible in the body, and cavities have been filled with a mixture of resin, dry matter (probably residue of oil or palm wine used to wash out the body), linen and probably also mud.

As regards the world-famous 'Zagreb mummy', the scans have revealed that there are no bone defects of the skull, which were mentioned in previous x-ray analyses. The new technology has provided a much clearer picture of the thoracic and abdominal cavities. The thorax is empty (the organs having been taken out of the mummy), while the abdomen and the pelvis have been filled with linen. The arthrotic changes are not extensive. None of the scans has detected any metal on the mummy's forehead, or anywhere else on the body, which suggests that the body is coated with some waxen substance.

The results of the latest investigation in Zagreb, completed in the autumn of 2011, have been published in a range of medical journals, and the scans have been uploaded to the Canadian internet-based database IMPACT, which collects data on all radiological investigations of Egyptian mummies carried out worldwide.



Sl. / Fig. 1



Sl. / Fig. 2



Sl. / Fig. 3